diplococcus said to be invariably present in cases of scarlatina and found in the throat secretions, blood, scales and urine of persons suffering from scarlet fever. He has spent much labour and time in endeavouring to place the title of this *Diplococcus scarlatinae* beyond dispute. The papers submitted, judging by the abstracts supplied by Prof. Conn, were of a high order, and the existence of such a society suggests that bacteriology in this country might well be accorded a more important place amongst the sciences than it at present occupies.

THE ninth edition of Mr. Bennett H. Brough's deservedly successful "Treatise on Mine-Surveying" has been published by Messrs. C. Griffin and Co. The book has been carefully revised, and new devices and appliances of importance are described. "The chief additions," we read, "consist of notices of the use of a spring balance for maintaining steel bands at a constant tension, of Mr. Langer's method of surveying with the hanging compass in the presence of iron, of Mr. Troye's method of marking underground stations, and of Mr. Landis's method of determining the volume excavated in open workings." By keeping his book up to date in this way, Mr. Brough makes his manual most valuable to mining students and mine-agents, who regard it as an essential volume for their libraries.

THE additions to the Zoological Society's Gardens during the past week include a Brown-headed Stork-billed Kingfisher (*Pelargopsis gurial*), an Eastern Calandra Lark (*Melanocorypha bimaculata*), an Eastern Linnet (*Acanthis fringillirostris*), a Glossy Calornis (*Calornis chalybeius*), a Small-billed Mountain Thrush (*Oreocincla dauma*), a Large Pied Wagtail (*Motacilla maderaspatensis*), an Ashy Wood Swallow (*Artamus fuscus*), a Bay-backed Shrike (*Lanius vittatus*), an Indian Great Reed Warbler (*Acrocephalus stentoreus*) from British India, a Pale Rose-finch (*Rhodospiza obsoleta*) from Afghanistan, presented by Mr. E. W. Harper; three Changeable Lizards (*Calotes versicolor*) from India, presented by Mr. R. C. McLaren; four Two-banded Monitors (*Varanus salvator*) from the East Indies, a Stump-tailed Lizard (*Trachydosaurus rugosus*) from Australia, four Changeable Lizards (*Calotes versicolor*) from India, twenty-four Black-spotted Lizards (*Algiroides nigro-punctatus*) from the Borders of the Adriatic, deposited; a Tasmanian Wolf (*Thylacinus cynocephalus*) from Tasmania, purchased; two Barbary Wild Sheep (*Ovis tragelaphus*) born in the Gardens.

OUR ASTRONOMICAL COLUMN.

DISTORTION OF SUN'S DISC AT HORIZON.—Prof. W. Prinz, of the Royal Observatory of Belgium (Brussels), has obtained several large-scale photographs of the setting sun, which show most distinctly the considerable deformation of the disc when near the horizon. The instrument employed was a photo-heliograph by Steinheil. A reproduction of one of the photographs accompanies the note in *Mem. della Soc. degli Spettroscopisti Italiani*, vol. xxxi. pp. 36–39. In this case the ratio of the vertical diameter to the horizontal one is as $75 : 84 = 0{\cdot}893$.

THE CROONIAN LECTURE.[1]

A PECULIAR interest—the parallel of that which in the plant organism belongs to chlorophyll—attaches to hæmoglobin, for, unlike any other chemical component of the animal body, in virtue of its special chemical and physical attributes, this remarkable substance may in the strictest sense be said to possess a definite and unique physiological function.

The region of the solar spectrum which the author formerly investigated was that comprised between the lines F and Q (4861—3280). The question whether oxy-hæmoglobin presents definite absorption for light of shorter wave-lengths has since been examined. Soret, whose observations were not conducted with solutions of hæmoglobin, but merely with diluted blood, observing by the aid of his fluorescent eye-piece the cadmium spark spectrum, found that diluted blood, in addition to the absorption band in the extreme violet, exhibited two additional bands. One of these, coinciding with the 12th cadmium line (3247), he considered to be probably due to hæmoglobin; the other, coinciding with the 17th cadmium line (2743), he assumed to be caused by serum albumin, his observations having previously shown that all albuminous and albuminoid bodies, with the exception of gelatin, are characterised by an absorption band in the position of the 17th cadmium line.

Employing solutions of many times crystallised oxy-hæmoglobin of great purity and of varying concentration, and with the aid of the sparks of a powerful induction coil, the author has obtained a series of photographs of the cadmium spark spectrum with and without the interposition of the solutions. The examination of these photographs shows that solutions of oxy-hæmoglobin which are sufficiently transparent to allow the ultra-violet spectrum of cadmium to be photographed present no absorption bands corresponding either to the 14th or the 17th cadmium lines. The absorption band observed by Soret in correspondence with line 14 is, therefore, not due to the blood colouring matter, but to some other organic constituent present in the blood.

Having referred to his researches communicated to the Royal Society in June 1901, and illustrated the main facts by actual demonstrations, the author discussed (1) observations on the influence of temperature on the behaviour of oxy-hæmoglobin in the magnetic field; (2) observations on the ferro-magnetism of the ferro-albuminates.

He next dealt with the question of the specific conductivity of solutions of pure oxy-hæmoglobin. After a laborious investigation on this branch of the subject, the following conclusions were arrived at:—

(1) Although solutions of oxy-hæmoglobin possess a low conductivity, this is very much higher than has been found in the previous observations of Stewart, all of which were made at 5° C.

(2) The conductivity of solutions of oxy-hæmoglobin increases rapidly with increase of temperature, and undergoes remarkable and permanent changes when the solution is kept for even short periods at any temperature above 0° C.

These results explain the impossibility of obtaining data which can be considered trustworthy concerning the *absolute specific resistance* of solutions of oxy-hæmoglobin.

Continuing the researches contained in his first communication to the Royal Society on the results of the electrolysis of oxy-hæmoglobin, the author has found that when pure solutions of oxy-hæmoglobin are subjected to electrolysis, there occurs a separation of oxy-hæmoglobin in a colloidal, but perfectly soluble form. He has worked with currents of from 12 to 24 volts, and the intensity of the electrolysing current measured by a milliampere-meter placed in the circuit has varied in different experiments between 0·1 and 3·0 milliamperes.

By employing an electrolytic cell in which the anode is separated from the kathode by an animal membrane (sheep's intestine or pig's bladder), it is seen that the first action of the current is to cause a separation of colloidal hæmoglobin in the anode cell. This colloidal hæmoglobin falls as a beautiful red cloud, leaving a perfectly colourless, supernatant liquid. On stirring it instantly dissolves.

The further action of the current is to cause a rapid and entire transfer of the colloidal hæmoglobin from the anode to the kathode cell. With an electrolytic cell, of which each compartment had a width of 5 mm. and contained 2·5 c.c. of a 1 per cent. solution of O_2Hb, complete precipitation and transfer occurs within 60 minutes.

On reversing the direction of the current by means of a communicator, the hæmoglobin returns again in the direction of the positive current into the original cell from which it started.

The author adduced evidence which proves that the precipitated colloidal, but yet perfectly soluble, hæmoglobin represents the undecomposed molecule of the blood-colouring matter.

The probable nature of the process which occurs under the influence of the current was discussed, as well as the character o.

[1] "On Certain Chemical and Physical Properties of Hæmoglobin" By Dr. Arthur Gamgee, F.R.S., Professor Emeritus of Physiology in the Owens College. Read before the Royal Society on March 13.

the process which leads to the transfer of the hæmoglobin in the direction of the positive current. This process is considered to be of the same nature as the phenomena studied by Quincke under the name of electro-endosmose.

Special attention was directed to the importance of the facts which the author has elicited in reference to the colloidal yet soluble form of oxy-hæmoglobin. It was pointed out that all which has been said with regard to oxy-hæmoglobin applies to CO-hæmoglobin.

A typical colloid in the sense of its absolute indiffusibility through animal membranes and parchment paper, oxy-hæmoglobin differs, however, from most colloids in the facility with which it crystallises. Hitherto it has been known in its crystalline condition and in solution in water. Now in its third or colloidal form the analogy with such a colloid as silicic acid is rendered complete.

The discovery of this form of hæmoglobin enables a conception to be formed of the state in which the blood colouring matter is probably contained in the blood corpuscles. It was known that the amount of hæmoglobin contained in the corpuscles is so large that in most animals at least the whole of the water of the blood would not be sufficient to dissolve it. It was perfectly obvious, therefore, that it did not exist in the corpuscles in a state of solution, and the opinion has generally been held that these contained some unknown compound of oxy-hæmoglobin with a constituent of the stroma. It seems highly probable that in the red blood corpuscle hæmoglobin may be merely present in its colloidal form.

Finally it was pointed out that the remarkable facility with which the new colloidal form of hæmoglobin traverses such permeable membranes as the animal membranes and even parchment paper, when its solutions are subjected to electrolysis, suggests to physiologists the possibility that certain of the phenomena of absorption in the animal body may be closely connected with electromotive changes in the tissues concerned.

QUANTITATIVE INVESTIGATIONS OF BIOLOGICAL PROBLEMS.

THE first part of the new publication, *Biometrika*, was noticed in these columns on December 5, 1901 (vol. lxv. p. 106). The second part, which we have now received, bears out the promise of its founders and shows that the new quantitative methods of investigating biological problems have every claim to rank as legitimate weapons of research. The present part contains five original communications and a number of miscellanea. Dr. Warren's paper on "Variation and Inheritance in the Parthenogenetic Generations of the Aphis *Hyalopterus trirhodus*" shows that variation within the family is 60 per cent. of the racial variation, that the offspring have no greater resemblance to the mother than in sexual reproduction, but that there may be a somewhat greater fraternal resemblance than among the offspring of sexual reproduction. Mr. W. P. Elderton, in a paper entitled "Tables for Testing the Goodness of Fit of Theory to Observation," provides a set of tables useful alike to physicists, biometricians and statisticians generally who want to ascertain rapidly whether the distribution of observed data, within the limits of "a sample," is in agreement with a proposed theory. Mr. Oswald Latter, as the result of measuring 243 eggs of cuckoos and comparing them with the eggs of the clutches in which they were deposited, has come to the conclusion that there is colour-matching in 50 per cent. of cases, and in certain of the remaining cases size-matching. The bearing of these results upon Prof. Newton's theory is considered, and that theory is shown to receive confirmation therefrom. The next paper, by Dr. W. R. Macdonell, has great practical interest in connection with criminal anthropology. The author has studied the index characters hitherto used in the identification of criminals, and now shows that there is a high degree of correlation between the organs selected. He indicates the best method of dealing with the measurements, and gives suggestions for calculating uncorrelated characters "which would furnish an ideal system of identification." In connection with that most important topic, the laws of inheritance in hybrids, Prof. W. F. R. Weldon gives an account of Mendel's results of crossing races of peas which differed in one or more of seven characters. To quote the abstract of this paper:—"From a study of the work of other observers, and from examination of the 'telephone' group of hybrids, the conclusion is drawn that Mendel's results do not justify any general statement concerning inheritance in cross-bred peas. A few striking cases of other cross-bred plants and animals are quoted to show that the results of crossing cannot, as Mendel and his followers suggest, be predicted from a knowledge of the characters of the two parents crossed without knowledge of the more remote ancestry."

The notes published under the miscellanea comprise one from Prof. C. B. Davenport in which he shows that in an "abnormal" species of Hydromedusæ, *Pseudoclytia pentata*, it appears that the less typical an individual the less its fertility, and irregular individuals are more sterile than those having some sort of symmetry. The typical form and symmetry thus tend to by preserved. Prof. Karl Pearson, from a comparison of the eggs of English and American house-sparrows, is enabled to warn biometricians "against drawing conclusions from types based on the 'modes' exhibited by small samples of living forms." In another note he also shows from mummy statistics furnished by Prof. Flinders Petrie that there has been a great increase in the expectation of life since the 2000 years which have elapsed from the Romano-Egyptian epoch. Out of 100 modern English alive at ten years of age, thirty-nine survive to be sixty-eight, while not nine survived out of 100 Romano-Egyptians. Prof. Pearson also contributes a note "On the Modal Value of an Organ of Character." Miss Agnes Fry writes on variation in leaves of mulberry trees, and gives illustrations of the leaves of eight trees of different ages. From this summary of its contents it will thus be seen that the new publication is fully entitled to that support which we urged in our notice of the first part.

THE KOZLOFF EXPEDITION TO TIBET.

THE last number of the *Izvestia* of the Russian Geographical Society (1901, iv.) contains a series of very interesting letters of Captain Kozloff, the head of the last Tibet expedition. They cover the most important part of his journey, from May 1900 to October 1901, during which Kozloff and his companions, Kaznakoff and Ladyghin, explored a quite unknown country, situated between the 36th and 29th degrees of latitude and 97–99° E. longitude. A preliminary map, 27 miles to the inch, illustrates these letters.

The expedition left Tsaidam in May 1900, after having organised a meteorological station at the old Tsaidam fort, Barun-tsasak (36° 5′ N. lat., 97° 30′ E. long., 8700 ft. alt.). It crossed the high border ridge, Burkhan budda, which runs N.W. to S.E., separating the high plains of Tsaidam from the high plateau of eastern Tibet, and reached the twin lakes of the upper Hoang-ho, Jarin-nor and Orin-nor, or Lakes Expedition and Russian, as they were named by Prjevalsky. The border ridge consists here of two parallel chains, the passes through which attain the respective heights of 15,700 and 15,600 feet, while separate peaks rise another 500 or 600 feet above the passes. Under the name of Amne-machin, it is continued further S.E. in the same direction, the Hoang-ho running on the high plateau at the south-western foot of the border-ridge.

The intention of Kozloff was to explore Inner Tibet and, if possible, to reach Hlassa; but as soon as they entered the territory of Hlassa, their route was barred by a military force. Yielding to the demands of the authorities, the expedition abandoned its intention of penetrating further west, and went southwards, with the intention of visiting the Chamdo (or Tsamdo) monastery; but its route was again and again barred by military detachments, so that finally Kozloff turned eastwards, under the 30th degree of latitude, and wintered on the Dza-chu, a tributary of the Mekong, thirty miles north of Chamdo. Later on, in the spring, he crossed once more the high range of mountains which, running N.W. to S.E., separates the Mekong from the Blue River, and reached this last under the 30th degree of latitude. There the expedition made the necessary preparations for the return journey, which was resumed in April 1901, exploring the Amne-machin region on the left bank of the Yang-tse, and returning eventually to the upper Hoang-ho lakes.

Having thus described a wide curve in Tibet, the Kozloff expedition explored lands totally unknown, where the three great rivers—the Hoang-ho, the Yang-tse, and the Mekong—descend from the high Tibet plateau to the lower regions of China, and which represented a real puzzle in the orography of Asia. It